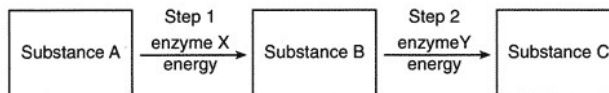


Name:

Date:

1

The diagram below represents the chemical pathway of a process in a human liver cell.



A particular liver cell is unable to make substance C. One possible explanation for the inability of this cell to make substance C is that

- (1) excess energy for step 2 prevented the conversion of substance B to substance C
- (2) an excess of enzyme X was present, resulting in a decrease in the production of substance B
- (3) nuclear DNA was altered resulting in the cell being unable to make enzyme Y
- (4) a mutation occurred causing a change in the ability of the cell to use substance C

2

When a person does strenuous exercise, small blood vessels (capillaries) near the surface of the skin increase in diameter. This change allows the body to be cooled. These statements best illustrate

- (1) synthesis
- (2) homeostasis
- (3) excretion
- (4) locomotion

3

Which sequence represents the correct order of levels of organization found in a complex organism?

- (1) cells → organelles → organs → organ systems → tissues
- (2) tissues → organs → organ systems → organelles → cells
- (3) organelles → cells → tissues → organs → organ systems
- (4) organs → organ systems → cells → tissues → organelles

4

Scientific studies show that identical twins who were separated at birth and raised in different homes may vary in height, weight, and intelligence. The most probable explanation for these differences is that

- (1) original genes of each twin increased in number as they developed
- (2) one twin received genes only from the mother while the other twin received genes only from the father
- (3) environments in which they were raised were different enough to affect the expression of their genes
- (4) environments in which they were raised were different enough to change the genetic makeup of both individuals

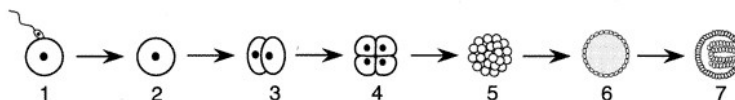
5

The instructions for the traits of an organism are coded in the arrangement of

- (1) glucose units in carbohydrate molecules
- (2) bases in DNA in the nucleus
- (3) fat molecules in the cell membrane
- (4) energy-rich bonds in starch molecules

6

The sequence of diagrams below represents some events in a reproductive process.



To regulate similar events in human reproduction, what adaptations are required?

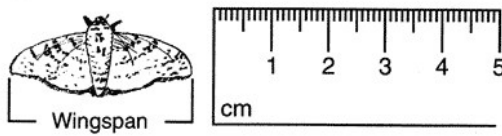
- (1) the presence of genes and chemicals in each cell in stages 1 to 7
- (2) an increase in the number of genes in each cell in stages 3 to 5
- (3) the removal of all enzymes from the cells in stage 7
- (4) the elimination of mutations from cells after stage 5

7

In animals, the normal development of an embryo is dependent on

- (1) fertilization of a mature egg by many sperm cells
- (2) production of new cells having twice the number of chromosomes as the zygote
- (3) production of body cells having half the number of chromosomes as the zygote
- (4) mitosis and the differentiation of cells after fertilization has occurred

A peppered moth and part of a metric ruler are represented in the diagram below.



Which row in the chart below best represents the ratio of body length to wingspan of the peppered moth?

Row	Body Length:Wingspan
(1)	1:1
(2)	2:1
(3)	1:2
(4)	2:2

Enzymes are used in moving sections of DNA that code for insulin from the pancreas cells of humans into a certain type of bacterial cell. This bacterial cell will reproduce, giving rise to offspring that are able to form

- (1) human insulin
- (2) antibodies against insulin
- (3) enzymes that digest insulin
- (4) a new type of insulin

Which statements best describe the relationship between the terms *chromosomes*, *genes*, and *nuclei*?

- (1) Chromosomes are found on genes. Genes are found in nuclei.
- (2) Chromosomes are found in nuclei. Nuclei are found in genes.
- (3) Genes are found on chromosomes. Chromosomes are found in nuclei.
- (4) Genes are found in nuclei. Nuclei are found in chromosomes.

11

In a cell, information that controls the production of proteins must pass from the nucleus to the

- (1) cell membrane
- (2) chloroplasts
- (3) mitochondria
- (4) ribosomes

12

Certain bacteria produce a chemical that makes them resistant to penicillin. Since these bacteria reproduce asexually, they usually produce offspring that

- (1) can be destroyed by penicillin
- (2) mutate into another species
- (3) are genetically different from their parents
- (4) survive exposure to penicillin

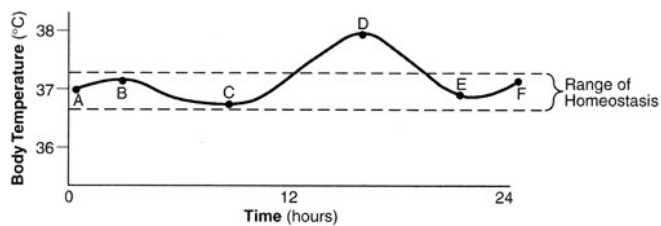
13

A sudden change in the DNA of a chromosome can usually be passed on to future generations if the change occurs in a

- (1) skin cell
- (2) liver cell
- (3) sex cell
- (4) brain cell

14

The data in the graph below show evidence of disease in the human body.

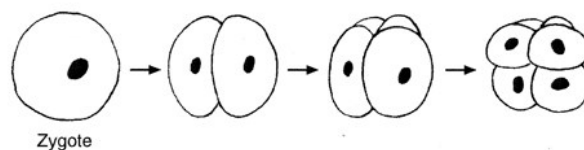


A disruption in dynamic equilibrium is indicated by the temperature change between points

- (1) A and B
- (2) B and C
- (3) C and D
- (4) E and F

15

The diagram below represents some stages of early embryonic development.



Which process is represented by the arrows in the diagram?

- (1) meiosis
- (2) fertilization
- (3) mitosis
- (4) evolution

16

The diagram below represents a developing bird egg.

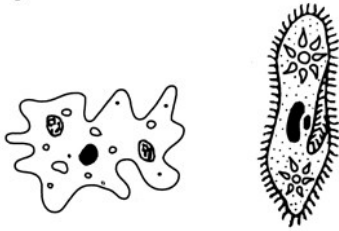


What is the primary function of this egg?

- (1) food supply for predators to preserve predator populations
- (2) adaptation to allow maximum freedom for parent birds
- (3) continuation of the species through reproduction
- (4) preservation of the exact genetic code of the parent birds

17

The diagram below represents two single-celled organisms.



These organisms carry out the activities needed to maintain homeostasis by using specialized internal

- (1) tissues
- (2) organelles
- (3) systems
- (4) organs

18

The genetic code of a DNA molecule is determined by a specific sequence of

- (1) ATP molecules
- (2) sugar molecules
- (3) chemical bonds
- (4) molecular bases

19

The cells that make up the skin of an individual have some functions different from the cells that make up the liver because

- (1) all cells have a common ancestor
- (2) different cells have different genetic material
- (3) environment and past history have no influence on cell function
- (4) different parts of genetic instructions are used in different types of cells

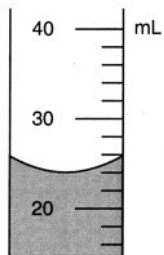
20

Which situation is *not* an example of the maintenance of a dynamic equilibrium in an organism?

- (1) Guard cells contribute to the regulation of water content in a geranium plant.
- (2) Water passes into an animal cell causing it to swell.
- (3) The release of insulin lowers the blood sugar level in a human after eating a big meal.
- (4) A runner perspires while running a race on a hot summer day.

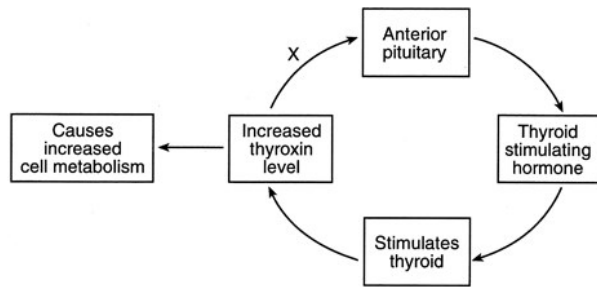
21

The diagram below shows a portion of a graduated cylinder.



What is the volume of the liquid in this cylinder?

- (1) 22 mL
- (2) 24 mL
- (3) 25 mL
- (4) 26 mL



22

This diagram illustrates part of

- (1) a feedback mechanism
- (2) an enzyme pathway
- (3) a digestive mechanism
- (4) a pattern of learned behavior

23

Describe the action represented by the arrow labeled X in the diagram and state *one* reason that this action is important. [2]

24

Identify *one* hormone involved in another biological relationship and an organ that is directly affected by the hormone you identified. [2]

25

Which statement best describes the relationship between cells, DNA, and proteins?

- (1) Cells contain DNA that controls the production of proteins.
- (2) DNA is composed of proteins that carry coded information for how cells function.
- (3) Proteins are used to produce cells that link amino acids together into DNA.
- (4) Cells are linked together by proteins to make different kinds of DNA molecules.

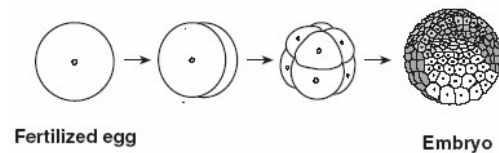
26

Research has shown that certain body cells, known as stem cells, can develop into a variety of specialized cells. Various factors can cause stem cells to develop into different types of mature cells. These different types of mature cells result from

- (1) different antibodies and mitotic cell division
- (2) identical genetic codes and meiotic cell division
- (3) different environments of the cells and the functioning of different parts of the genetic code
- (4) similar steps in the development of the cells and a reduction in the number of chromosomes in each cell

27

Part of embryonic development in a species is illustrated in the diagram below.

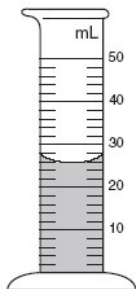


Which set of factors plays the most direct role in controlling the events shown in the diagram?

- (1) genes, hormones, and cell location
- (2) antibodies, insulin, and starch
- (3) ATP, amino acids, and inorganic compounds
- (4) abiotic resources, homeostasis, and selective breeding

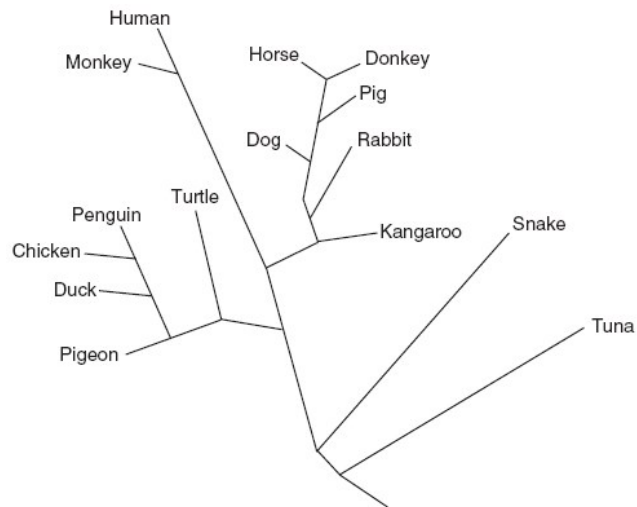
28

What is the volume of the liquid in the graduated cylinder shown below?



- (1) 23 mL
- (2) 26 mL
- (3) 27 mL
- (4) 28 mL

Based on their analysis of the differences in amino acid sequences of one kind of protein, scientists prepared the evolutionary tree shown below.



29

According to this diagram, the DNA of which pair of organisms would show the greatest similarity?

- (1) penguin and turtle
- (2) horse and donkey
- (3) snake and tuna
- (4) turtle and rabbit

30

Humans require organ systems to carry out life processes. Single-celled organisms do not have organ systems and yet they are able to carry out life processes. This is because

- (1) human organ systems lack the organelles found in single-celled organisms
- (2) a human cell is more efficient than the cell of a single-celled organism
- (3) it is not necessary for single-celled organisms to maintain homeostasis
- (4) organelles present in single-celled organisms act in a manner similar to organ systems

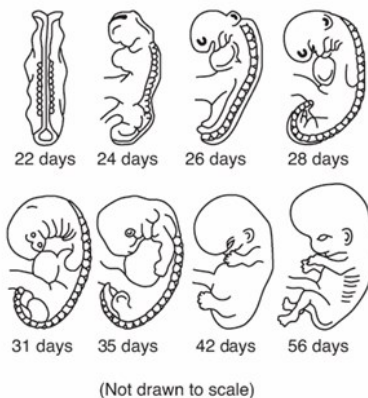
31

Asexually reproducing organisms pass on hereditary information as

- (1) sequences of A, T, C, and G
- (2) chains of complex amino acids
- (3) folded protein molecules
- (4) simple inorganic sugars

32

The development of an embryo is represented in the diagram below.



These changes in the form of the embryo are a direct result of

- (1) uncontrolled cell division and mutations
- (2) differentiation and growth
- (3) antibodies and antigens inherited from the father
- (4) meiosis and fertilization

33

Which laboratory procedure is represented in the diagram below?



- (1) placing a coverslip over a specimen
- (2) removing a coverslip from a slide
- (3) adding stain to a slide without removing the coverslip
- (4) reducing the size of air bubbles under a coverslip

34

The development of an experimental research plan should *not* include a

- (1) list of safety precautions for the experiment
- (2) list of equipment needed for conducting the experiment
- (3) procedure for the use of technologies needed for the experiment
- (4) conclusion based on data expected to be collected in the experiment

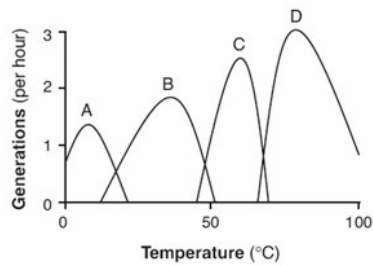
35

A student performed an experiment to demonstrate that a plant needs chlorophyll for photosynthesis. He used plants that had green leaves with white areas. After exposing the plants to sunlight, he removed a leaf from each plant and processed the leaves to remove the chlorophyll. He then tested each leaf for the presence of starch. Starch was found in the area of the leaf that was green, and no starch was found in the area of the leaf that was white. He concluded that chlorophyll is necessary for photosynthesis.

Which statement represents an assumption the student had to make in order to draw this conclusion?

- (1) Starch is synthesized from the glucose produced in the green areas of the leaf.
- (2) Starch is converted to chlorophyll in the green areas of the leaf.
- (3) The white areas of the leaf do not have cells.
- (4) The green areas of the leaf are heterotrophic.

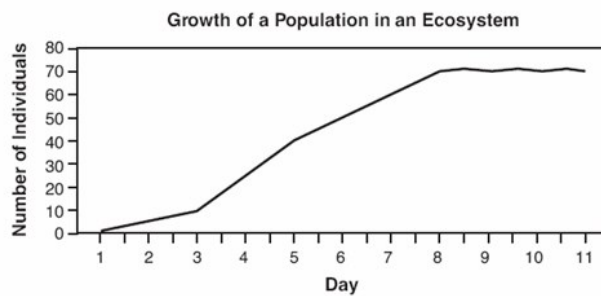
The graph below provides information about the reproductive rates of four species of bacteria, A, B, C, and D, at different temperatures.



Which statement is a valid conclusion based on the information in the graph?

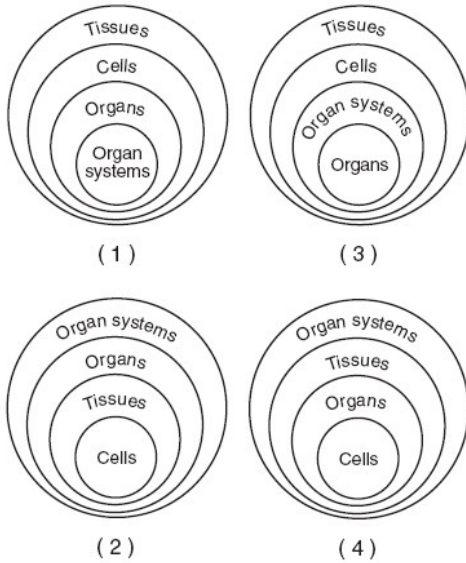
- (1) Changes in temperature cause bacteria to adapt to form new species.
- (2) Increasing temperatures speed up bacterial reproduction.
- (3) Bacteria can survive only at temperatures between 0°C and 100°C.
- (4) Individual species reproduce within a specific range of temperatures.

On which day did the population represented in the graph below reach the carrying capacity of the ecosystem?

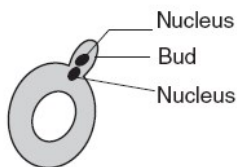


- (1) day 11
- (2) day 8
- (3) day 3
- (4) day 5

Which diagram best represents the levels of organization in the human body?



The diagram below represents a yeast cell that is in the process of budding, a form of asexual reproduction.



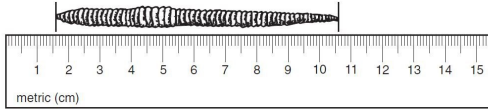
Which statement describes the outcome of this process?

- (1) The bud will develop into a zygote.
- (2) The two cells that result will each contain half the species number of chromosomes.
- (3) The two cells that result will have identical DNA.
- (4) The bud will start to divide by the process of meiotic cell division.

Tissues develop from a zygote as a direct result of the processes of

- (1) fertilization and meiosis
- (2) fertilization and differentiation
- (3) mitosis and meiosis
- (4) mitosis and differentiation

What is the approximate length of the earthworm shown in the diagram below?



- (1) 9 mm (3) 10.6 cm
(2) 90 mm (4) 106 cm

Information concerning the diet of crocodiles of different sizes is contained in the table below.

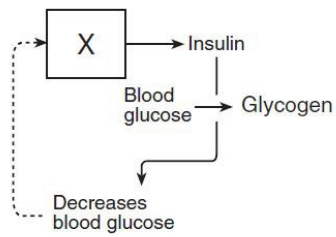
Percentage of Crocodiles of Different Lengths and Their Food Sources

Food Source	Group A 0.3–0.5 Meter	Group B 2.5–3.9 Meters	Group C 4.5–5.0 Meters
mammals	0	18	65
reptiles	0	17	48
fish	0	62	38
birds	0	17	0
snails	0	25	0
shellfish	0	5	0
spiders	20	0	0
frogs	35	0	0
insects	100	2	0

Which statement is not a valid conclusion based on the data?

- (1) Overharvesting of fish could have a negative impact on group C.
(2) The smaller the crocodile is, the larger the prey.
(3) Group B has no preference between reptiles and birds.
(4) Spraying insecticides would have the most direct impact on group A.

43



The dashed line in the diagram represents

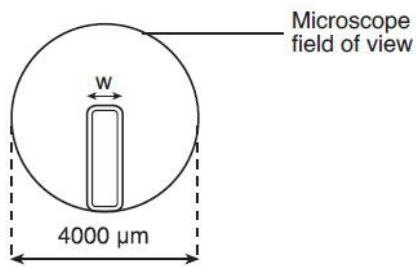
- (1) a digestive process
- (2) a feedback mechanism
- (3) cellular differentiation
- (4) recycling of organic chemicals

44

Students were asked to determine if they could squeeze a clothespin more times in a minute after resting than after exercising. An experiment that accurately tests this question should include all of the following except

- (1) a hypothesis on which to base the design of the experiment
- (2) a large number of students
- (3) two sets of clothespins, one that is easy to open and one that is more difficult to open
- (4) a control group and an experimental group with equal numbers of students of approximately the same age

A plant cell in a microscopic field of view is represented below.



The width (w) of this plant cell is closest to

- (1) 200 μm
- (2) 800 μm
- (3) 1200 μm
- (4) 1600 μm